Abandoned Uranium Mine Site Assessment for the Tom Site (NM0127)

FINAL REPORT

Prepared For:

New Mexico Energy, Minerals and
Natural Resources Department
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May 28, 2010

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1.0 INTRODUCTION

INTERA Incorporated (INTERA) has prepared this Abandoned Uranium Mine (AUM) Site Assessment Report for the Mining and Minerals Division (MMD) of the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) in compliance with the Professional Service Agreement dated November 2, 2009. INTERA visited the Tom Site (AUM Site), MMD ID: NM0127 on April 16, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

Anderson (1980) visited the AUM Site in 1980 and found several stripped areas and bench cuts in Todilto Formation limestone. No uranium mineralization was apparent, but 900 counts per second were recorded on a dark band in one of the cuts. Ore was produced from the Tom Site from 1954 to 1955 (Anderson, 1980).

1.2 SITE LOCATION AND DIRECTIONS

The AUM Site is on private and federal (Bureau of Land Management) land in the southern half of Section 4, Township 11 North, Range 9 West. The Site is located in Cibola County (formerly part of Valencia County), approximately 6 miles east-northeast of the town of Milan. The location of this Site was provided to INTERA by MMD.

To access the AUM Site from Albuquerque, drive west on Interstate 40 for 83 miles. Take Exit 79 towards San Mateo and turn right. Continue straight until you reach U. S. 66, less than a quarter mile. Turn left on U.S. 66 and drive 0.2 miles, then turn right onto New Mexico 605. Continue northeast on New Mexico 605 for approximately 5.4 miles, then turn right on a dirt road, passing through a locked gate. Continue on this dirt road for 3.75 miles, then turn right on Forest Service Road 450. Continue south on Forest Service Road 450 for 0.3 miles, then turn right on a faint road. Continue southwest for approximately 0.9 miles. Then, turn onto the first road on the right and drive 0.7 miles. After 0.7 miles, the road forks. Keep right and drive for 1.2 miles to the AUM Site.

Note that permission from one private landowner is required to travel along the access road, and permission from another private landowner is required to view the Site itself.

1.3 SITE GEOLOGY

The AUM site lies within the Grants uranium region. The topography of this region is characterized by mesas of Triassic to Cretaceous strata separated by broad valleys. The Site area is part of the Chaco Slope, the southern part of the San Juan Basin. Strata in the Chaco Slope dip gently to the north (McLemore, 2002).

The AUM Site is located within the Todilto Formation, a Jurassic sequence of carbonates and evaporites. This formation likely represents a salt lake environment intermittently connected to the ocean. The Todilto Formation is underlain by the Entrada Formation and overlain by the Summerville Formation (Hilpert, 1963). The Todilto consists of two members, the upper Tonque Arroyo Member and the lower Luciano Mesa Member. The Tonque Arroyo Member consists of gypsum and is absent from the Site area. The Luciano Mesa Member consists of

thinly laminated, locally deformed lower layer and a massive, vuggy upper layer (Lucas and Anderson, 2000). The exposed Todilto Formation at the AUM Site consists of thinly bedded (approximately 0.5 ft) limestone with some yellow uranium mineralization along fracture surfaces. Faults are also present in exposed bedrock.

1.4 SITE HYDROGEOLOGY

The surface runoff at the AUM Site discharges west-southwest across a broad alluvial fan, eventually draining into the Rio San Jose approximately 6.5 miles to the west. There is no nearby permanent surface water, but stock tanks are present downstream of the AUM Site.

The AUM Site is located in the Bluewater Underground Water Basin. This basin falls between the San Juan Underground Water Basin to the north, the Middle Rio Grande Underground Water Basin to the south and east, and the Gallup Underground Water Basin to the west (Edwards and Kiely, 2004). Aquifers are found in alluvium near major drainages such as San Mateo Creek and throughout the Cretaceous, Jurassic, and Triassic strata in the region. Groundwater flows southward in alluvium and northeast in Mesozoic strata (Brod, 1979).

1.5 REGIONAL TOPOGRAPHY AND TERRAIN

The AUM Site is found on the Grants Quadrangle 7.5 minute United States Geological Survey topographic map at an elevation of approximately 7000 ft above mean sea level (see Figure 2). The AUM Site is located on the northwest slope of East Grants Ridge, a narrow mesa trending northeast. Topography to the northwest of the Site slopes gently to the west. To the south and east, the topography is much steeper, rising to about 7500 ft above mean sea level at the top of East Grants Ridge.

2.0 MINE FEATURES

The mine features described below are based on the features provided to INTERA by MMD in the GIS Data Dictionary (MMD, 2009). INTERA marked the locations of the AUM Site features using a Trimble Global Positioning System (GPS), and entered details about the features into the GPS using the MMD data dictionary. Five open cuts, one pile, two pile ridges, and one mine road were found onsite. Please see the Photo Log in Appendix A for photos of the AUM Site features, Table 1 for a list of the AUM Site features, and Figures 4a and 4b for the locations of the AUM Site features.

2.1 MINE SHAFTS, ADITS, AND DECLINES

No mine shafts, adits, or declines were found at the AUM Site.

2.2 MINING AND EXPLORATION PITS AND OPEN CUTS

Five open cuts were found at the AUM Site. CutPly-1 is the rim-stripped area mentioned by Anderson (1980); see Photos 1-3 in Appendix A of this report and Photo (a) in Anderson (1980). The highest gamma radiation reading on this open cut was 70 µR/hr at 0 ft above ground at radiation survey point Rad-1. CutPly-2 (see Photo 5 in Appendix A) is due west of CutPly-1,

and the maximum gamma radiation reading was 16 µR/hr at 0 ft above ground at radiation survey point Rad-5. CutPly-3 (about 150 ft northeast of CutPly-2; see Photos 8 and 9 in Appendix A) had some yellow uranium mineralization on fracture surfaces. The maximum gamma radiation reading at this open cut was 250 µR/hr above ground at radiation survey point Rad-7. CutPly-4 (see Photo 10 in Appendix A) lies downslope and to the northwest of CutPly-2. The maximum gamma radiation reading at this open cut was 240 µR/hr at 0 ft above ground at radiation survey point Rad-8. CutPly-5 is the bench cut mentioned in Anderson (1980); see Photos 11, 13, and 14 in Appendix A of this report and Photo (b) in Anderson (1980). CutPly-5 is along the current mine road (Access-1). The maximum gamma radiation reading at this open cut was 360 µR/hr at 0 ft above ground at radiation survey point Rad-9.

CutPly-2 and CutPly-4 are located inside the MMD-provided shapefiles.

2.3 WASTE AND ORE PILES AND DISTURBANCES

One waste pile (PilePly-1) and two pile ridges (PileRidge-1 and PileRidge-2) were found at the AUM Site. PilePly-1 lies west and downslope of CutPly-1 (see Photo 4 in Appendix A). The maximum gamma radiation reading on this pile was 18 µR/hr at 0 ft above ground at radiation survey point Rad-3. PileRidge-1 (see Photo 6 in Appendix A) and PileRidge-2 (see Photo 7 in Appendix A) lie between CutPly-2 and CutPly-3. The maximum gamma radiation measured on these pile ridges was 15 µR/hr at 0 ft above ground at radiation survey point Rad-6.

2.4 MINING RELATED BUILDINGS AND FOUNDATIONS

No mining related buildings or foundations were found at the AUM Site.

2.5 OTHER MINE FEATURES

A mine road (Rd-1) connects CutPly-2 and CutPly-3. This road continues east (Rd-2), connecting CutPly-3 and CutPly-1.

2.6 BOREHOLES

No boreholes were found at the AUM Site.

2.7 RECLAMATION ACTIVITIES

No reclamation activities were identified onsite.

3.0 ARCHEOLOGICAL SITES

No apparent archeological sites were identified at or near this AUM Site.

4.0 SITE GAMMA RADIATION READINGS

One background gamma radiation reading was taken near the AUM Site, recording 8 µR/hr at 0 ft above ground and 8 µR/hr at 4 ft above ground. Please see Table 2 for all of the gamma radiation readings taken at the AUM Site and Figures 4a and 4b for the locations of the radiation readings.

The maximum gamma radiation measured onsite was 360 µR/hr at 0 ft above ground at radiation survey point Rad-9, associated with CutPly-5. Another notable radiation reading was 250 µR/hr at 0 ft above ground at radiation survey point Rad-7, associated with CutPly-3. In addition, a radiation reading at CutPly-4 measured 240 µR/hr at 0 ft above ground at radiation survey point Rad-8.

5.0 CURRENT LAND USES

5.1 HUMAN ACTIVITY AND RECREATIONAL SITE USE

Cow and horse prints were found onsite, and horses were seen along the access route after leaving the AUM Site. Corrals and other nearby ranch structures indicate that the area is active ranchland.

5.2 NEARBY RESIDENTIAL, COMMERCIAL AND INDUSTRIAL STRUCTURES

No structures were sighted within a mile of the AUM Site.

5.3 NEARBY DOMESTIC WELLS

No domestic wells are located within a mile of the AUM Site. However, two stock wells (B-01666 and B-01623) are located within a mile of the Site (NMOSE, 2008).

5.4 EVIDENCE OF GRAZING OR AGRICULTURE

Evidence of cows and horses, along with nearby ranch structures, indicates that the area is active ranchland.

5.5 EVIDENCE OF WILDLIFE

Meadowlarks and other small birds were observed onsite. Rabbit droppings were identified.

6.0 VEGETATION

The Tom site is located between in the Coniferous and Mixed Woodland vegetation type. Vegetation is dominated by pinyon pine and several juniper species. Other woody species include fourwing saltbush, yucca, and cholla. Forbs were present at the site and included different aster species. Grass species present were Indian ricegrass, hairy grama, and curly-mesquite. No evidence of noxious weeds was found onsite.

7.0 POTENTIAL OFFSITE IMPACTS

7.1 EROSION

No evidence of erosion was observed onsite.

7.2 ENVIRONMENTAL IMPACTS

There is no evidence of soil staining from chemicals potentially brought to the AUM Site.

8.0 REFERENCES

Anderson, Orin J., 1980. Abandoned or Inactive Uranium Mines in New Mexico. New Mexico Bureau of Mines and Mineral Resources Open File Report 148.

Brod, Robert C., 1979. Hydrogeology and Water Resources of the Ambrosia Lake-San Mateo Area, McKinley and Valencia Counties, New Mexico. Master's thesis. New Mexico Institute of Mining and Technology, Socorro, New Mexico.

Edwards, Mark H. and Kiely, Jeffrey, 2004. Cibola-McKinley Regional Water Plan. Prepared for the New Mexico Interstate Stream Commission.

Hilpert, Lowell S., 1963. Regional and Local Stratigraphy of Uranium-Bearing Rocks in Kelley, Vincent C., ed. Geology and Technology of the Grants Uranium Region. New Mexico Bureau of Mines and Mineral Resources, Memoir 15.

Lucas, S. G. and Anderson, Orin J., 2000. The Todilto Salina Basin, Middle Jurassic of the U. S. Southwest in E. H. Gierlowski-Kordesch and K. R. Kelts, eds, Lake Basins Through Space and Time: AAPG Studies in Geology, 46, p. 153-158.

McLemore, Virginia T., 2002. Navajo Lake State Park: New Mexico Geology, v. 24, no. 3, p. 91-96,103.

Mining and Minerals Division (MMD), 2009. Mine Feature Data Dictionary.

TABLES

Table 1
Site Features

Tom-NM0127
Abandoned Uranium Mine Assessments

Feature Name	On Site?	Feature Type	Associated Feature	Material	Height or Depth (ft)	Width or Diameter (ft)	Length (ft)	Open	Collapsed	Closure Type	Associated Photo	Notes
Access-1	No	Access	Dirt Maintained	--	--	--	--	--	--	--	--	--
CutPly-1	Yes	--	--	--	10	20	75	--	--	--	NM0127_001 NM0127_002 NM0127_003	--
CutPly-2	Yes	--	--	--	20	30	100	--	--	--	NM0127_005	--
CutPly-3	Yes	--	--	--	5	20	90	--	--	--	NM0127_008 NM0127_009	--
CutPly-4	Yes	--	--	--	15	25	75	--	--	--	NM0127_010	--
CutPly-5	Yes	--	--	--	8	15	120	--	--	--	NM0127_011 NM0127_012 NM0127_013 NM0127_014	--
PilePly-1	Yes	Waste	--	Rock	3	15	45	--	--	--	NM0127_004	--
PileRidge-1	Yes	--	--	--	3	10	225	--	--	--	NM0127_006	--
PileRidge-2	Yes	--	--	--	2	5	40	--	--	--	NM0127_007	--
Rd-1	Yes	2-Track	Dirt Nonmaintained	--	--	--	--	--	--	--	--	--
Rd-2	Yes	2-Track	Dirt Nonmaintained	--	--	--	--	--	--	--	--	--

Notes:
-- designates no information

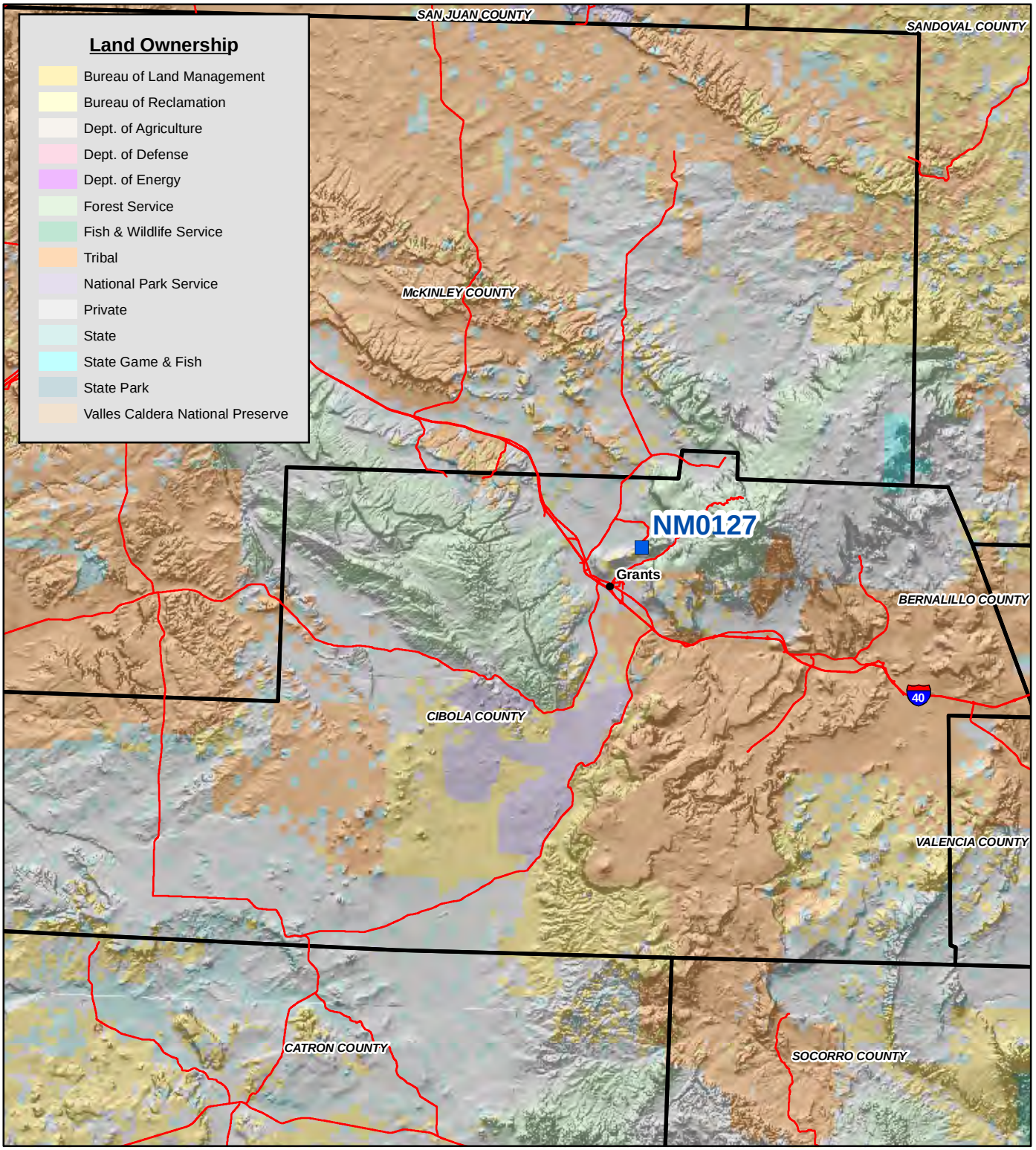
Table 2
Gamma Radiation Survey Results

Tom-NM0127
Abandoned Uranium Mine Assessments

Reading ID	0 ft (µR/hr)	4 ft (µR/hr)	Associated Photo	Asssociated Feature
Rad-1	70	17	--	CutPly-1
Rad-2	22	17	--	CutPly-1
Rad-3	18	9	--	PilePly-2
Rad-4	6	6	--	PileRidge-1
Rad-5	16	10	--	CutPly-2
Rad-6	15	9	--	PileRidge-2
Rad-7	250	27	--	CutPly-3
Rad-8	240	40	--	CutPly-4
Rad-9	360	40	--	CutPly-5
Rad-10	250	40	NM0127_014	CutPly-5
Rad-11	11	11	--	PilePly-5
RadBack-1	8	8	--	--

Notes:
All gamma readings at this site taken by Ludlum 192 µR/Ratemeter
µR/hr=microroetgens per hour
-- designates no information

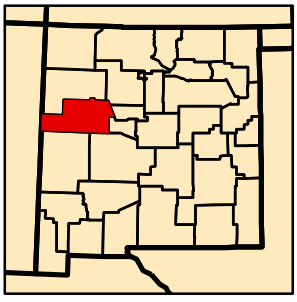
FIGURES



Map Source(s):
Ownership - BLM, 2008

0 7.5 15 30
Miles

NORTH



Legend

- AUM Location
- Road
- County Boundary

Figure 1
Site Location Map
NM0127-Tom
Abandoned Uranium Mine Assessment

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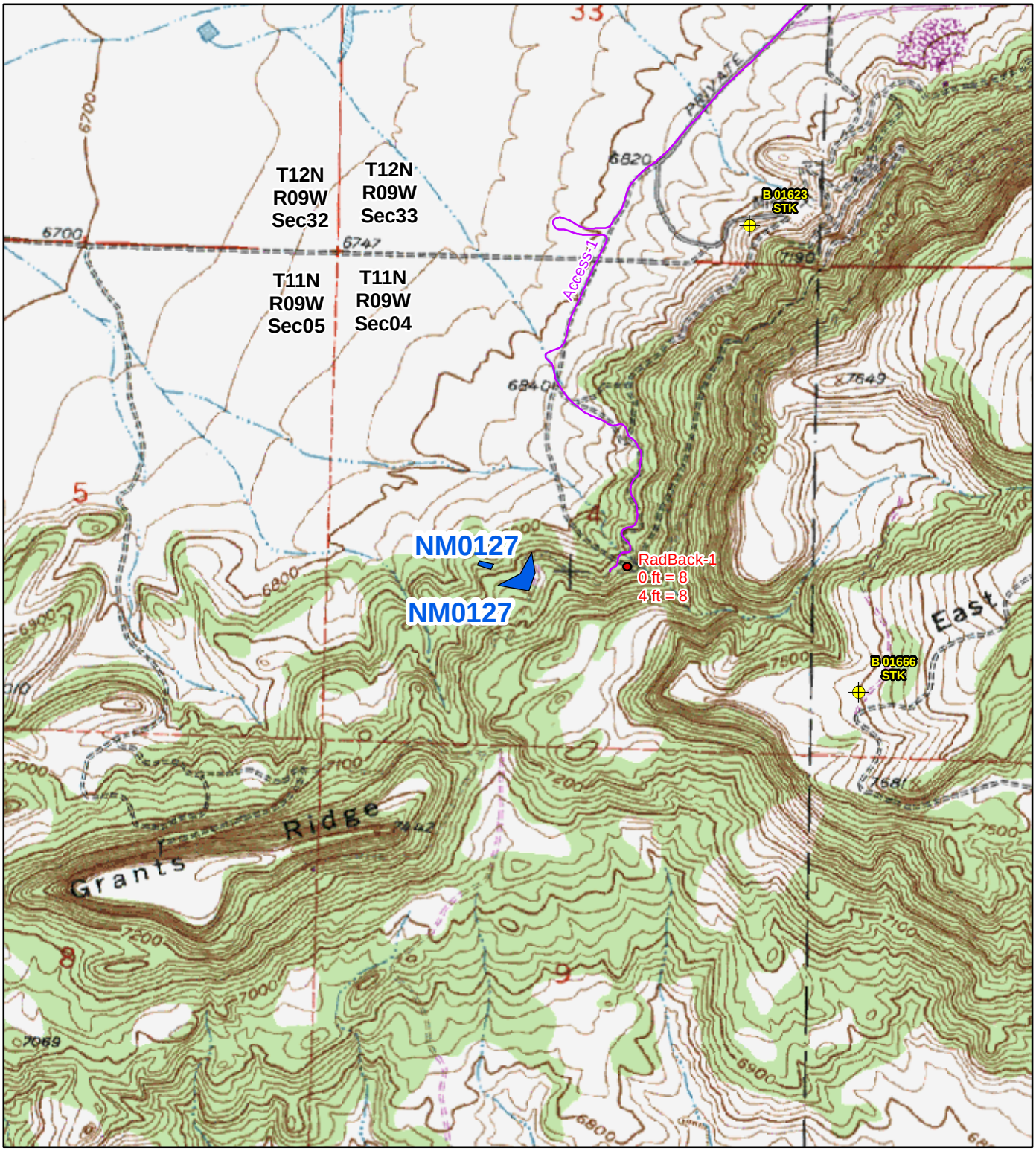

Map Source(s):
U.S. Geological Survey 7.5-Minute
Topographic Map
-Grants, 1981

0 750 1,500 3,000
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Well Within 1 Mile of Site
- Access Route
- AUM Location Boundary (MMD Provided)

Figure 2
Topographic Map
NM0127-Tom
Abandoned Uranium
Mine Assessment

INTERA

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0127-Tom\GIS\Map\Topo_Map_Tom_CP.mxd 04/21/2010

Map Source(s):
U.S. Geological Survey 7.5-Minute
DOQQ County Mosaic
-Cibola County, 2009

0 750 1,500 3,000
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Well Within 1 Mile of Site
- Access Route
- AUM Location Boundary (MMD Provided)
- Section Boundary
- Township/Range Boundary

Figure 3
Aerial Photo
NM0127-Tom
Abandoned Uranium
Mine Assessment

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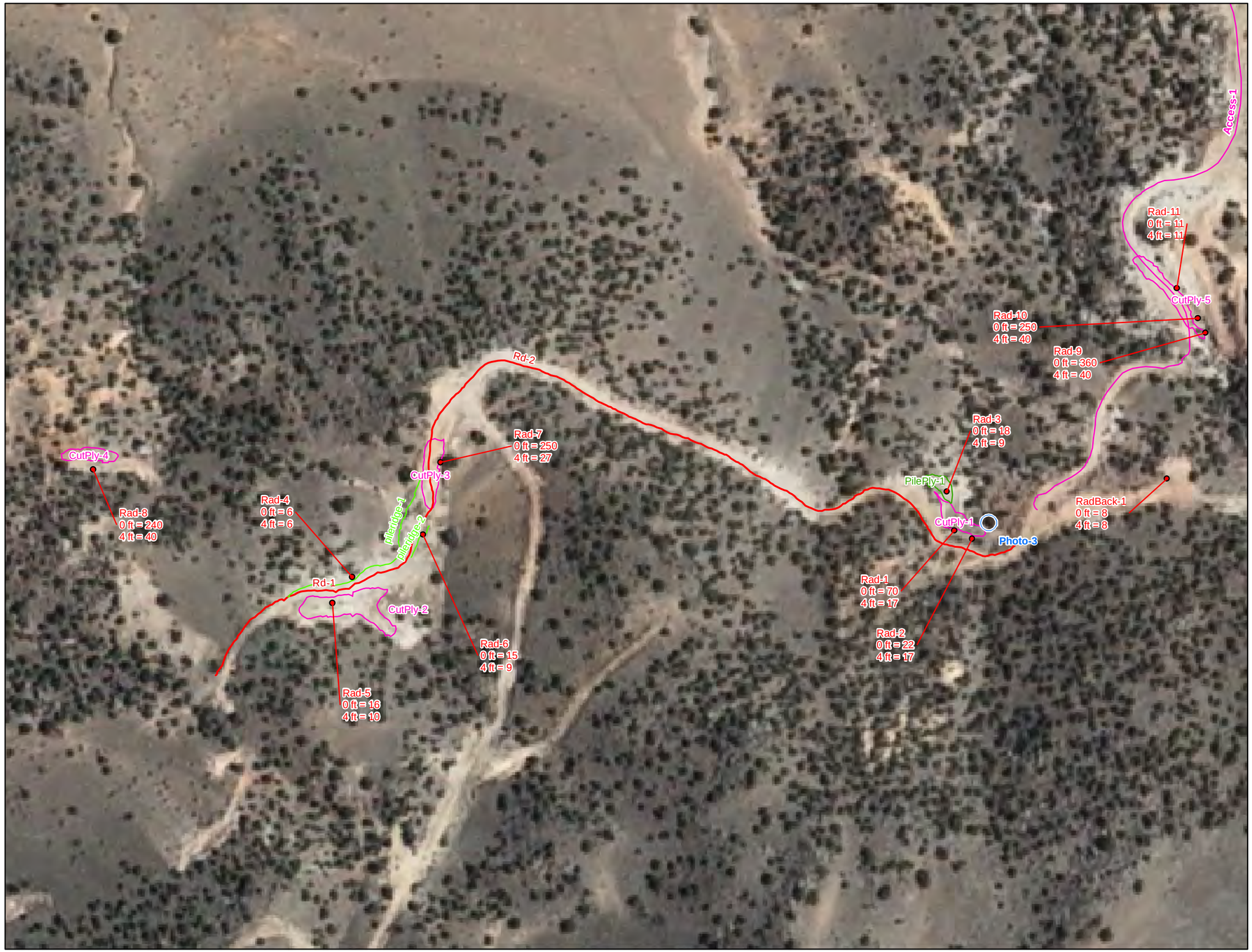


Legend

- Radiation Readings (µR/hr)
- Photo Location
- Pile Ridge
- Mine Road
- Access Route
- Pile Boundary
- Open Cut Boundary

0 65 130 260

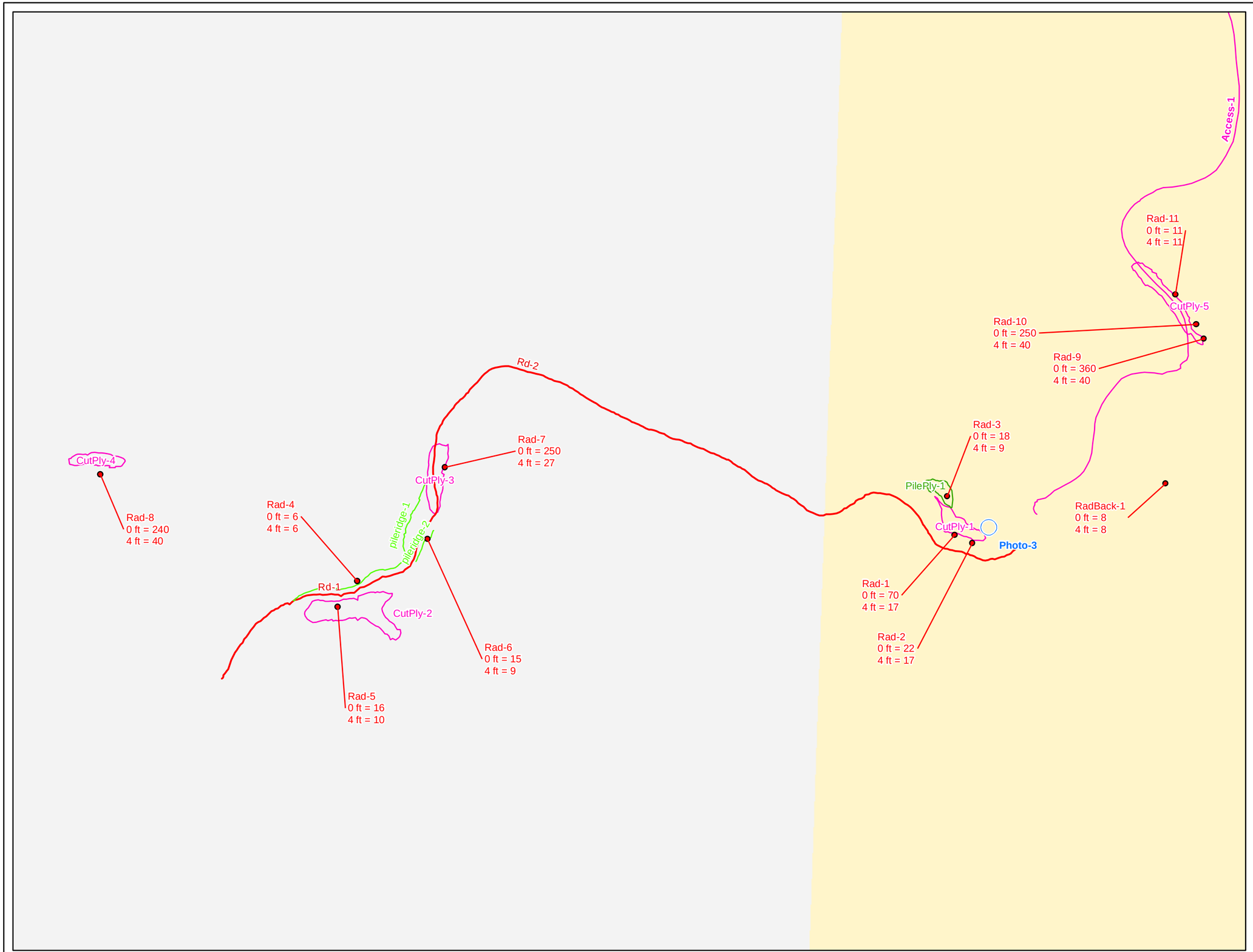
Feet

NORTH

Map Source(s):
U.S. Geological Survey 7.5-Minute
DOQQ County Mosaic
-Cibola County, 2009

Figure 4a
Site Map on
Aerial Photo
NM0127-Tom
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0127-Tom\GIS\Map\CloseupAerial_Map_Tom_CP.mxd 04/21/2010



Legend

- Radiation Readings (µR/hr)
- Photo Location
- Pile Ridge
- Mine Road
- Access Route
- Pile Boundary
- Open Cut Boundary

Surface Ownership

- Bureau of Land Management
- Private

0 65 130 260

Feet

NORTH

Map Source(s):
Ownership - BLM, 2008

Figure 4b
Site Map with Surface Ownership
NM0127-Tom
Abandoned Uranium Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0127-Tom\GIS\Map\CloseupOwnership_Map_Tom_CP.mxd 04/21/2010

APPENDIX A

PHOTO LOG

Note: Gaps in the numbering sequence of the photos is the result of removing photos not suitable for the report. A full set of photos is provided in the electronic deliverable.

Photo 1-Looking southwest at CutPly-1, replicating Anderson Photo (a).

Photo 2-Looking south at CutPly-1.

Photo 3-Site photo, looking southwest at CutPly-1. The mine number on the white board is incorrect. It should read “NM0127”.

Photo 4-Looking northwest at PilePly-1.

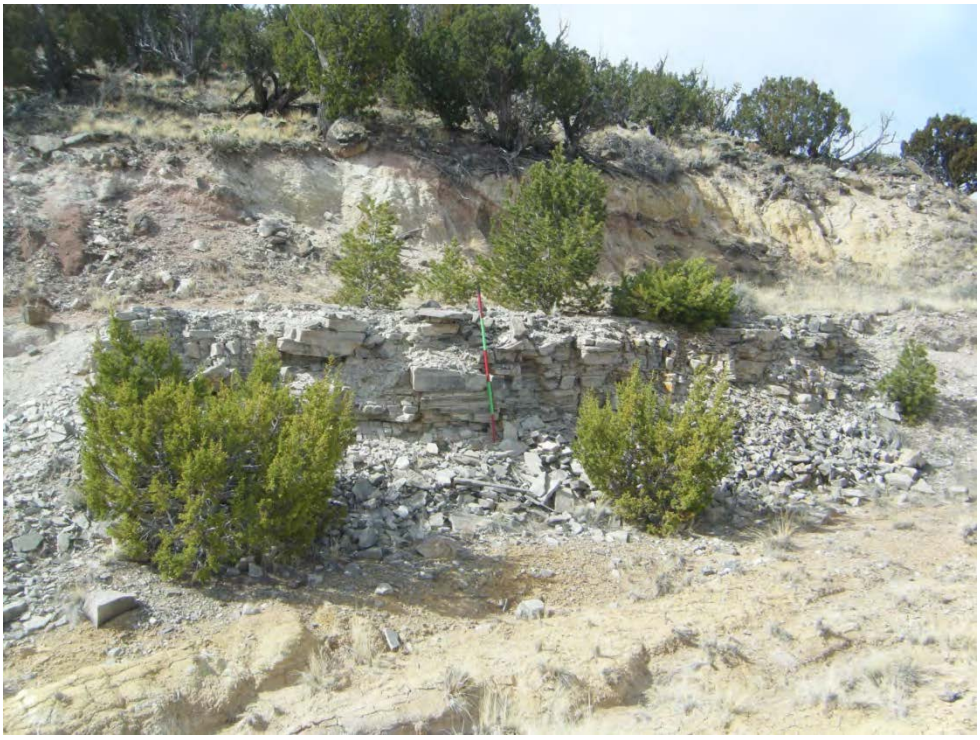


Photo 5-Looking south at CutPly-2.

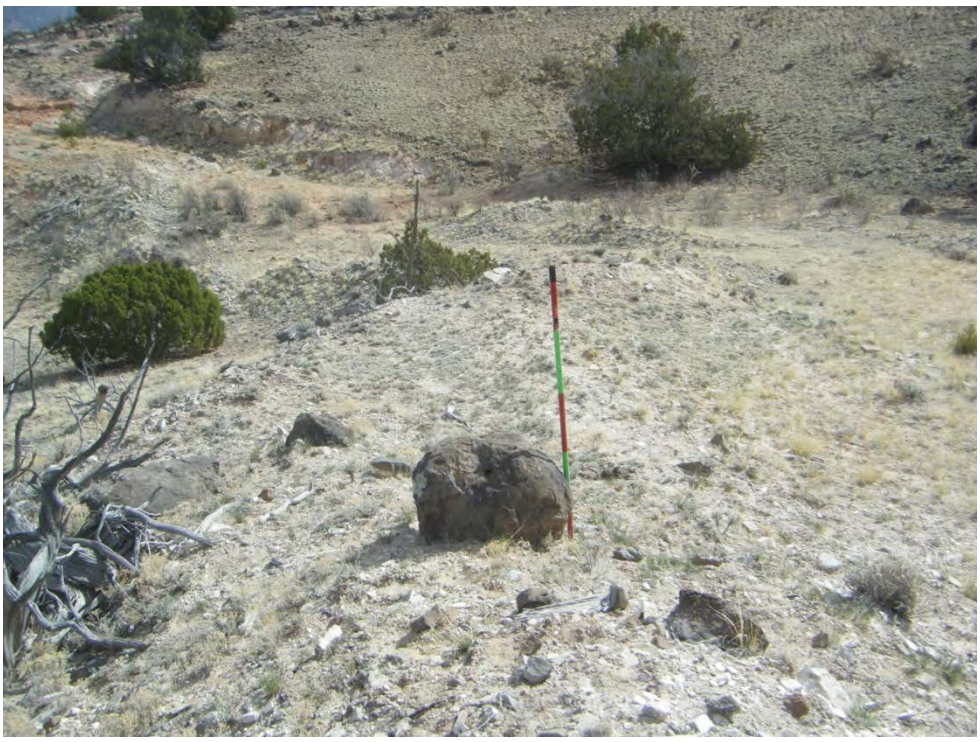


Photo 6-Looking east at PileRidge-1.

Photo 7-Looking north at PileRidge-2.

Photo 8-Looking north at CutPly-3.

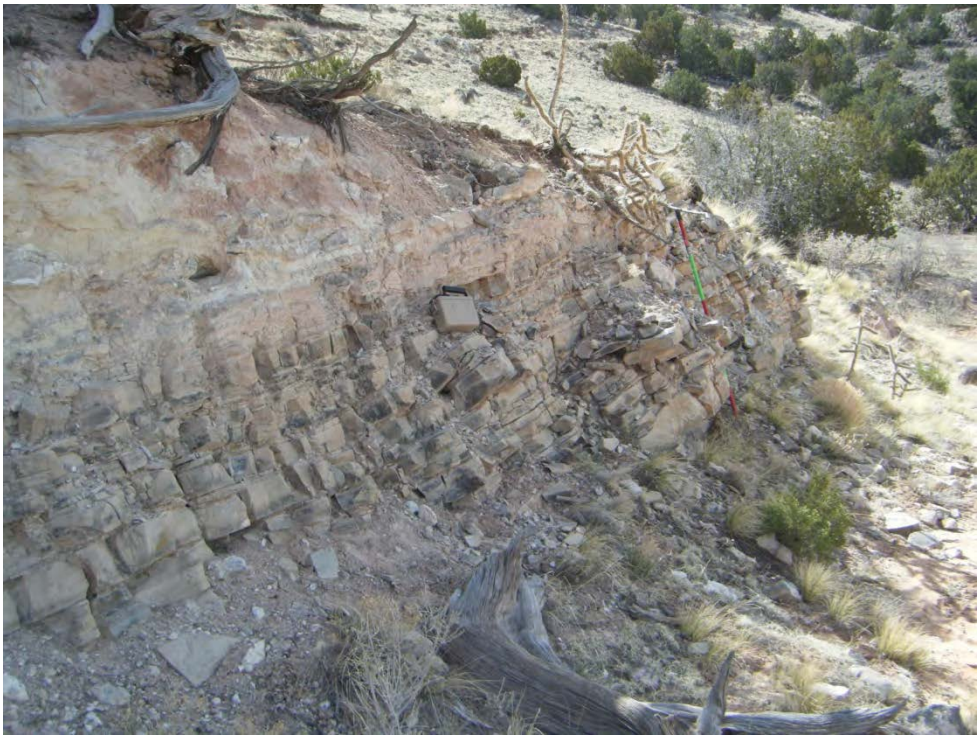


Photo 9-Looking southeast at CutPly-3.

Photo 10-Looking southwest at CutPly-4.

Photo 11-Looking north-northeast at CutPly-5.

Photo 13-Looking north-northeast at CutPly-5, replicating Anderson Photo (b).

Photo 14-Looking northwest at radiation survey point Rad-10 (250 µR/hr at 0 ft above ground).

Photo 28-AUM Site vegetation.

APPENDIX B

FIELD NOTES

4/16/10 ALT Abandoned Uranium Mines

Site Name: NM0127, Tom

Objective: Site Assessment

Personnel: Annelia Tinklenberg
Danny Bowman

Equipment: Rental truck, Trimbel GeoXM (SN: 4948447277, 2008 series), Ludlum 192 (SN: 234149), Fujifilm digital camera (No. 80839493), backup Garmin GPS, cell phone amplifier, field laptop.

900 At the Aum Site

Background Rad - 0m - 8 uR/h; 1m - 8 uR/h

Photo 1 - looking southwest at CutPly 1, per Anderson photo a.

CutPly-1 - 10' deep, 20' wide, 75' long
Photo 2 - looking south at cutply-1
Rad 1 - CutPly1 face; 0m - 70 uR/h; 1m - 17 uR/h

Photo 3 - Site name looking southwest at CutPly 1

Rad 2 - CutPly-1; 0m - 22 uR/h; 1m - 17 uR/h

PilePly-1 - 3' high, 15' wide, 45' long
Photo 4 - looking northwest at PilePly1
Rad 3 - PilePly-1; 0m - 18 uR/h; 1m - 9 uR/h

Photo 5 - looking south at cut Ply 2
At AUM Polygon:
PileRidge-1 - 3' high, 10' wide, 225' long
Photo 6 - looking east at PileRidge-1
Rad 4 - PileRidge-1; 0m - 6 uR/h; 1m - 6 uR/h

CutPly 2 - 20' deep, 30' wide, 100' long
Rad 5 - CutPly 2; 0m - 16 uR/h; 1m - 10 uR/h

PileRidge 2 - 2' high, 5' wide, 40' long
Photo 7 - looking north at PileRidge 2
Rad 6 - PileRidge 2; 0m - 15 uR/h; 1m - 9 uR/h

CutPly 3 - 5' high, 20' wide, 90' long
Photo 8 - looking north at Cut Ply 3
Rad 7 - CutPly 3; 0m - 250 uR/h; 1m - 27 uR/h
Photo 9 - looking southeast at CutPly 3
CutPly 4 - 15' deep, 25' wide, 75' long
Photo 10 - looking southwest at CutPly-4
Rad 8 - CutPly 4; 0m - 240 uR/h; 1m - 40 uR/h

CutPly 5 - 8' tall, 15' wide, 120' long; New access/mine road
Photos 11-13 - looking north-northeast at CutPly 5, per Anderson photo b.
Rad 9 - CutPly 5; 0m - 360 uR/h; 1m - 40 uR/h
Rad 10 - CutPly 5; 0m - 250 uR/h; 1m - 40 uR/h
Photo 14 - looking northeast at CutPly 5 face and Rad 10
Rad 11 - CutPly 5; 0m - 11 uR/h; 1m - 11 uR/h

Photos 15-28 - Vegetation

Access Route - Current Mine Road

1130 Leaving site

Soils: Tan-Red sandy, rocky; thin
Rocks: Tan-Red sandstone; Grey Todilto Limestone; Black volcanic Basalt
Human Activities: Cows and horses; prints, corrals, fences current mine roads and activity
Wildlife: Rabbit droppings, meadow lark, other small birds

1215 At Homestake to return gate keys

13 4/16/10 ALT Abandoned Uranium Mines